

**PSP Cover Sheet**

Proposal Title: TUOLUMNE RIVER SEDIMENT MANAGEMENT PLAN

Applicant Name: Sedimentation and River Hydraulics Group, T S C, Bureau of Reclamation

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Amount of funding requested: \$ 279,000 for 2 years

Indicate the Topic for which you are applying (check only one box).

- |   |   |
|---|---|
| <input type="checkbox"/> Fish Passage/Fish Screens      | <input type="checkbox"/> Introduced Species       |
| <input checked="" type="checkbox"/> Habitat Restoration | <input type="checkbox"/> Fish Management/Hatchery |
| <input type="checkbox"/> Local Watershed Stewardship    | <input type="checkbox"/> Environmental Education  |
| <input type="checkbox"/> Water Quality                  |   |

Does the proposal address a specified Focused Action? X yes        no

What county or counties is the project located in? Stanislaus and Tuolumne

Indicate the geographic area of your proposal (check only one box):

- |   |   |
|---|---|
| <input type="checkbox"/> Sacramento River Mainstem    | <input type="checkbox"/> East Side Trib:                        |
| <input type="checkbox"/> Sacramento Trib:             | <input type="checkbox"/> Suisun Marsh and Bay                   |
| <input type="checkbox"/> San Joaquin River Mainstem   | <input type="checkbox"/> North Bay/South Bay:                   |
| <input checked="" type="checkbox"/> San Joaquin Trib: | <input type="checkbox"/> Landscape (entire Bay-Delta watershed) |
| <input type="checkbox"/> Delta:                       | <input type="checkbox"/> Other:                                 |

Indicate the primary species which the proposal addresses (check all that apply):

- |  |  |
|--|--|
| <input type="checkbox"/> San Joaquin and East-side Delta tributaries fall-run chinook salmon | <input type="checkbox"/> Winter-run chinook salmon               |
| <input checked="" type="checkbox"/> Spring-run chinook salmon                                | <input checked="" type="checkbox"/> Late-fall run chinook salmon |
| <input checked="" type="checkbox"/> Fall-run chinook salmon                                  | <input type="checkbox"/> Delta smelt                             |
| <input type="checkbox"/> Longfin smelt   | <input type="checkbox"/> Splittail                               |
| <input checked="" type="checkbox"/> Steelhead trout  | <input type="checkbox"/> Green sturgeon                          |
| <input type="checkbox"/> Striped bass  | <input type="checkbox"/> Migratory birds                         |
| <input type="checkbox"/> All chinook species   | <input type="checkbox"/> Other:                                  |
| <input type="checkbox"/> All anadromous salmonids  |  |

Specify the ERP strategic objective and target (s) that the project addresses. Include page numbers from January 1999 version of ERP Volume I and II:

The applicable Strategic Objectives for this sediment management plan are subsets of the 1999 Strategic Objectives (ERP, Volume I, pages 54, 72-73, 80, 89) as applied to the Tuolumne River:

1) Make sure that high flows occur frequently enough in the lower reach to maintain channel and flood plain geometry and river-bed-sediment grain-size distributions favorable to chinook salmon; 2) Restore gravel supplies to the upstream end of the lower reach of the Tuolumne River, just downstream from the La Grange Reservoir and restore the natural sediment transport processes along the lower reach; 3) Increase the extent of freely meandering reaches and other pre-1850 river channel forms; 4) Re-establish frequent inundation of the flood plains of the lower reach by removing, breaching, or setting back levees and by providing releases from La Grange Dam capable of inundating the flood plains. The sediment management plan will guide the application of ongoing and possible additional projects to meet these Strategic Objectives, especially objective #2. The sediment management plan is a direct response to the Course Sediment Supply Target, programmatic actions, stage 1 actions and rationale described on page 435 of ERP, Volume II. However, the sediment management plan for the lower reach must also address the river channel and flood plain geometry, the riverbed sediments and inflowing sediments (if any), and the river hydrology as one integrated fluvial transport system for both water and sediment. Therefore the plan is tightly linked to other targets.

Indicate the type of applicant (check only one box):

- |  |  |
|--|--|
| <input type="checkbox"/> State agency                    | <input checked="" type="checkbox"/> Federal agency |
| <input type="checkbox"/> Public/Non-profit joint venture | <input type="checkbox"/> Non-profit                |
| <input type="checkbox"/> Local government/district       | <input type="checkbox"/> Private party             |
| <input type="checkbox"/> University                      | <input type="checkbox"/> Other:                    |

Indicate the type of project (check only one box):

- |  |   |
|--|---|
| <input checked="" type="checkbox"/> Planning | <input type="checkbox"/> Implementation |
| <input type="checkbox"/> Monitoring          | <input type="checkbox"/> Education      |
| <input type="checkbox"/> Research            |   |

By signing below, the applicant declares the following:

- 1.) The truthfulness of all representations in their proposal;
- 2.) The individual signing the form is entitled to submit the application on behalf of the applicant (if the applicant is an entity or organization); and
- 3.) The person submitting the application has read and understood the conflict of interest and confidentiality discussion in the PSP (Section 2.4) and waives any and all rights to privacy and confidentiality of the proposal on behalf of the applicant, to the extent as provided in the Section.

Chih Ted Yang

Printed name of applicant

Signature of applicant

**TITLE PAGE**

**TUOLUMNE RIVER SEDIMENT MANAGEMENT PLAN**

Proposed by:

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Federal Agency: U.S. Department of the Interior  
Tax Exempt Number: 140001849

## EXECUTIVE SUMMARY

**Project Description** The Tuolumne River Sediment Management Plan is proposed to describe a) the natural sediment transport along the reach of the Tuolumne River between New Don Pedro Reservoir and the junction with the San Joaquin River (the lower reach, about 52 miles long), b) the present state of sediment transport in that reach as affected by human endeavors, c) the changes needed to return the riverbed to a dynamic condition equal or close to its natural state, and d) the steps required to monitor that return and evaluate the success of the projects involved. Gold mining, gravel mining, dams and flow diversions have changed the riverine and riparian environments by interrupting the natural sediment movement and degrading the natural habitats of the fish and other animals that depend on this river. The management plan will use computer models for the sediment transport with the reduced water flows within the lower reach to provide a plan for the remediation of this interruption of the natural sediment processes.

**Primary Biological/Ecological Objectives** The Strategic Goal for this sediment management plan is a subset of the second goal of the CALFED Bay-Delta Program (Ecosystem Restoration Plan, 1999 [ERP], Volume 1, page 1) as applied to the Tuolumne River: Rehabilitate the natural fluvial conditions (slowly aggrading, meandering, gravel-bed; alluvial sediment and water flow) of the lower reach of the Tuolumne River to provide habitat for chinook salmon and steelhead trout and their food chain. The applicable Strategic Objectives for this sediment management plan are subsets of the 1999 Strategic Objectives (ERP, Volume 1, pages 54, 72-73, 80, 89) as applied to the Tuolumne River: 1) Make sure that high flows occur frequently enough in the lower reach to maintain channel and flood plain geometry and river-bed-sediment grain-size distributions favorable to chinook salmon; 2) restore gravel supplies to the upstream end of the lower reach of the Tuolumne River, just downstream from the La Grange Reservoir and restore the natural sediment transport processes along the lower reach; 3) increase the extent of freely meandering reaches and other pre-1850 river channel forms; 4) re-establish frequent inundation of the flood plains of the lower reach by removing, breaching, or setting back levees and by providing releases from La Grange Dam capable of inundating the flood plains. The sediment management plan will guide the application of ongoing and possible additional projects to meet these Strategic Objectives, especially objective #2.

The sediment management plan is a direct response to the Course Sediment Supply Target, programmatic actions, stage 1 actions and rationale described on page 435 of ERP, Volume II. However, the sediment management plan for the lower reach must also address the river channel and flood plain geometry, the riverbed sediments and inflowing sediments (if any), and the river hydrology as one integrated fluvial transport system for both water and sediment.

**Cost** The total cost of the project is \$279,000. The project is divided into two phases, the development of the sediment management plan in fiscal year 2000 and the monitoring of the progress of implemented sediment-management projects in fiscal year 2001.

**Adverse and Third Party Impacts** The gravel pit operators and the water supply agencies and irrigation districts may have third party impacts of the projects proposed in the sediment management plan but no impacts in the development of that sediment plan.

**Applicant Qualifications** Chih Ted Yang (Manager, Sedimentation and River Hydraulics Group) supervises and directs the Sedimentation and River Hydraulics Group of the Technical Service Center, U. S. Bureau of Reclamation. He received the Doctor of Philosophy degree from Colorado State University in 1968 and is a Professional Engineer registered in Colorado. Dr. Yang is the author of a recent text book, *Sediment Transport: Theory and Practice*, the author of more than 100 publications on sedimentation and river hydraulics, and an advisor and expert consultant to U. S. government agencies, the United Nations, and foreign government agencies on water resources projects. He is one of the original authors of the Generalized Stream Tube model for Alluvial River Simulation (GSTARS) 2.0 sediment model. He will be a technical expert for this project.

Peter J. Murphy (Hydraulic Engineer, Sedimentation and River Hydraulics Group, Technical Services Center, Bureau of Reclamation) will be the team leader (manager) for this project. He received the Doctor of Philosophy degree in Fluid Mechanics from the Johns Hopkins University in 1968 and is a Professional Engineer (Civil) registered in the Commonwealth of Massachusetts. From 1968 to 1984, Dr. Murphy served on the faculty of the Civil Engineering Departments of three Universities: La Universidad del Valle in Cali, Colombia; Cornell University, and the University of Massachusetts at Amherst. Since February 1998, Dr. Murphy has worked as a hydraulic engineer in the Sedimentation and River Hydraulics Group of the U.S. Bureau of Reclamation. He has done a variety of tasks, including testing and improving the GSTARS 2.0 sediment-transport computer model, and assisting with and reviewing stream restoration projects.

**Monitoring and Data Evaluation** Standard U.S. Geological Survey bed load traps and suspended sediment traps will be used at six bridges, together with the flow rate measurements of the U.S. Geological Survey at two gauging stations to measure the sediment transport rates along the lower reach of the Tuolumne River. The sediment transport data will be used to calculate the annual mass balance of each grain size collected in the sediment samples. The mass balances will show how near the sediment transport is to dynamic equilibrium on a year-by-year and long term basis. A fish counting station will be established at the East Modesto Road Bridge to identify and count the migrating at-risk fish in the lower reach. The year-to-year history of the fish count will be used to evaluate the success of the overall restoration efforts.

**Local Support/Coordination with Other Programs** The Stanislaus and Tuolumne County Boards of Supervisors and the Turlock Irrigation District have been notified in writing of the potential submission of this proposal. Cooperation with the Tuolumne River technical working group will begin if and when this proposal is funded.

**Compatibility with CALFED Objectives** The Strategic Goal for this sediment management plan is to rehabilitate the natural fluvial conditions (slowly aggrading, meandering, gravel-bed; alluvial sediment and water flow) of the lower reach of the Tuolumne River to provide habitat for chinook salmon and steelhead trout and their food chain. The sediment management plan may provide levee system integrity and flood control benefits along the lower reach of the Tuolumne River, but may also conflict with the needs of flood control. The sediment management plan may prevent the degradation of the river channel and the undermining of bridge foundations. The sediment plan may conflict with the needs of water supply from the Tuolumne River.

## PROJECT DESCRIPTION

**a. Proposed Scope of Work.** The Tuolumne River Sediment Management Plan is proposed to describe the natural sediment transport along the reach of the Tuolumne River between the New Don Pedro Reservoir and the junction with the San Joaquin River (the lower reach), the present state of sediment transport in that reach as affected by human endeavor, the changes needed to return the riverbed to a dynamic condition equal or close to its natural state, and the steps required to monitor and evaluate the success of the projects involved. Gold mining, gravel mining, dams and flow diversions have changed the riverine and riparian environments and degraded the natural habitats of the fish and other animals that depend on this river. This sediment management plan is one part of the process of limiting the environmental damage caused by these manmade changes and reestablishing habitats that approximate the natural ones.

The natural Tuolumne River was part of the habitat for fish, insects, animals and plants. Ocean-going chinook salmon spent the first part of their lives in the river. The river supported a long food chain that fed those salmon, and the salmon in turn fed bear and humans. The manmade changes did not protect these life cycles, and many species native to the river are threatened or in danger of extinction.

The gold mining left dredge tailings in the river channel and on the flood plains of the portion to the lower reach downstream from the town of La Grange. The gravel mining removed and continues to remove spawning-bed material from the river in the portion of the reach downstream from those dredge tailings. The reservoirs of Hetch Hetchy Dam, New Don Pedro Dam and La Grange Dam reduced the flood flows of water and especially sediment that formed the natural riverbed of the lower reach. The diversions from the river at the Hetch Hetchy reservoir for municipal water supply and at the La Grange reservoir for agricultural irrigation also reduced the flow rates in the lower reach.

Restoration projects supported by CALFED have already begun to return the river environment towards its natural state. The Turlock Irrigation District (TID) has two projects for channel restoration and habitat improvement in the lower reach of the Tuolumne River. The California Department of Fish and Game (DFG) has two smaller projects to improve the habitat near the Basso Bridge, one of 16 bridges crossing the Tuolumne River in the lower reach. These projects will partially remediate the effects of the gold and gravel mining.

However, human demands for water are high in California and, therefore, the water supply and irrigation dams will not be removed and the reduced flows of water through the lower reach of the Tuolumne River will continue. These reduced flows can be managed to simulate a scaled-down version of the natural hydrology of the lower reach of the river. The reservoirs behind the dams trap the sediment moving down from the Sierra Nevada, and so the water below the dams no longer deposits sediment on the valley floor of the Tuolumne River as that river decreases its slope and joins the plain of the San Joaquin River. The management plan for the sediment transport with the reduced water flows within the lower reach will provide a plan for the remediation of this interruption of the natural sediment processes.

**b. Project Approach.** Define the geometry and sediment of the natural (before 1850) riverbed and the river's hydrology, hydraulics, and sediment transport processes within computer models. Connect these three processes to the natural state of the annual spawning cycle of at-risk fish and the biological and environmental conditions affected by these natural fluvial habitat processes. Define the present state of the geometry and sediment of the riverbed and the present river's hydrology, hydraulics, and sediment transport within computer models, including the gravel mining, dams and flow diversions and ongoing restoration planning and projects-in-progress on that reach of the Tuolumne River. Define the various alternative sediment-related steps that could be taken to return the river closer to its natural condition: move the active gravel mining away from the river, fill in-channel gravel pits and break other gravel pits' connections to the river to eliminate warm water habitat, reshape the river channel and flood plains of the dredge spoil sub-reach to form a main channel with meanders and flood plains, add gravel to the upstream portion of the reach to balance any degradation caused by New Don Pedro and La Grange Dams, run flushing flows through the reach to cleanse gravel beds of most sands and other fine sediments and form a gravel armor layer, etc. Recommend the best alternatives to implement the return to a more natural river channel. Include in the management plan the hydrology of the 1995 Federal Energy Regulatory Commission Order for New Don Pedro Dam and the potential U.S. Army Corps of Engineers study of the channel capacity in the lower reach. Define the future states of the river's hydrology, hydraulics, and sediment transport corresponding to these alternatives steps within computer models. Clearly outline the projects needed to implement the best sediment transport procedure and the two next-best procedures. Question the effectiveness of reduced watershed erosion rates and sediment detention basins in reducing the load of fine sediments in the lower Tuolumne River channel. Monitor the progress of the projects implemented to improve habitat and evaluate their degree of success.

No construction methods or materials are needed for the development of this sediment plan.

Standard U.S. Geological Survey (USGS) stream-gauging and sediment-data-gathering equipment, survey-grade global-positioning-system (GPS) equipment, and personal computers will be used in this project. The specialized software needed for the hydrologic, hydraulic and sediment transport analyses are currently available to the Sedimentation and River Hydraulics Group, Technical Services Center, Bureau of Reclamation. One new GPS unit will be purchased to complement one existing unit. The equipment, laboratory space and office space of the Group are located in the Denver Federal Center.

**c. Project Tasks.**

1. Data gathering (geometry, sediment, hydrology) to prepare computer models of fluvial transport. Previous and present: surveying of cross sections in reach, estimation of Manning's "n" in reach, bed material sampling in reach and reservoir deposits, USGS flow rate data at gauging stations and reservoir discharge operating rules. Review any previous analyses.
2. Calibration and validation studies of computer models ( HEC-RAS, DAMBRK, HEC6-T, GSTARS 2.0). Analysis by execution of computer models ( HEC-RAS, DAMBRK, HEC6-T, GSTARS 2.0) to describe and understand natural processes and present-day processes.
3. Definition and comparison of various alternatives steps that could be taken to return the river closer to its natural condition and recommend three methods to implement that return.

4. Define the future states of the river's hydrology, hydraulics, and sediment transport corresponding to these alternatives by analysis with execution of computer models ( HEC-RAS, DAMBRK, HEC6-T, GSTARS). Write report.

5. Data gathering (geometry, sediment, hydrology, fish count) to follow the progress of the sediment restoration projects that are implemented and demonstrate the level of their success.

6. Evaluation by comparison of new stream morphology and its biota with the older, larger river and with the present-day river; evaluation by comparison of the new stream and its biota with nearby undisturbed streams of the same size and fluvial morphology. Write report.

7. Project management by preparing financial and technical reports and supervising other personnel working on the project.

**d. Project Phases and Deliverables.** Phase 1:Written report following tasks 1 through 4 with appendices on disk containing data and computer input/output. Phase 2:Written report following tasks 5 and 6 with data appendix on disk. The two phases may be funded separately.

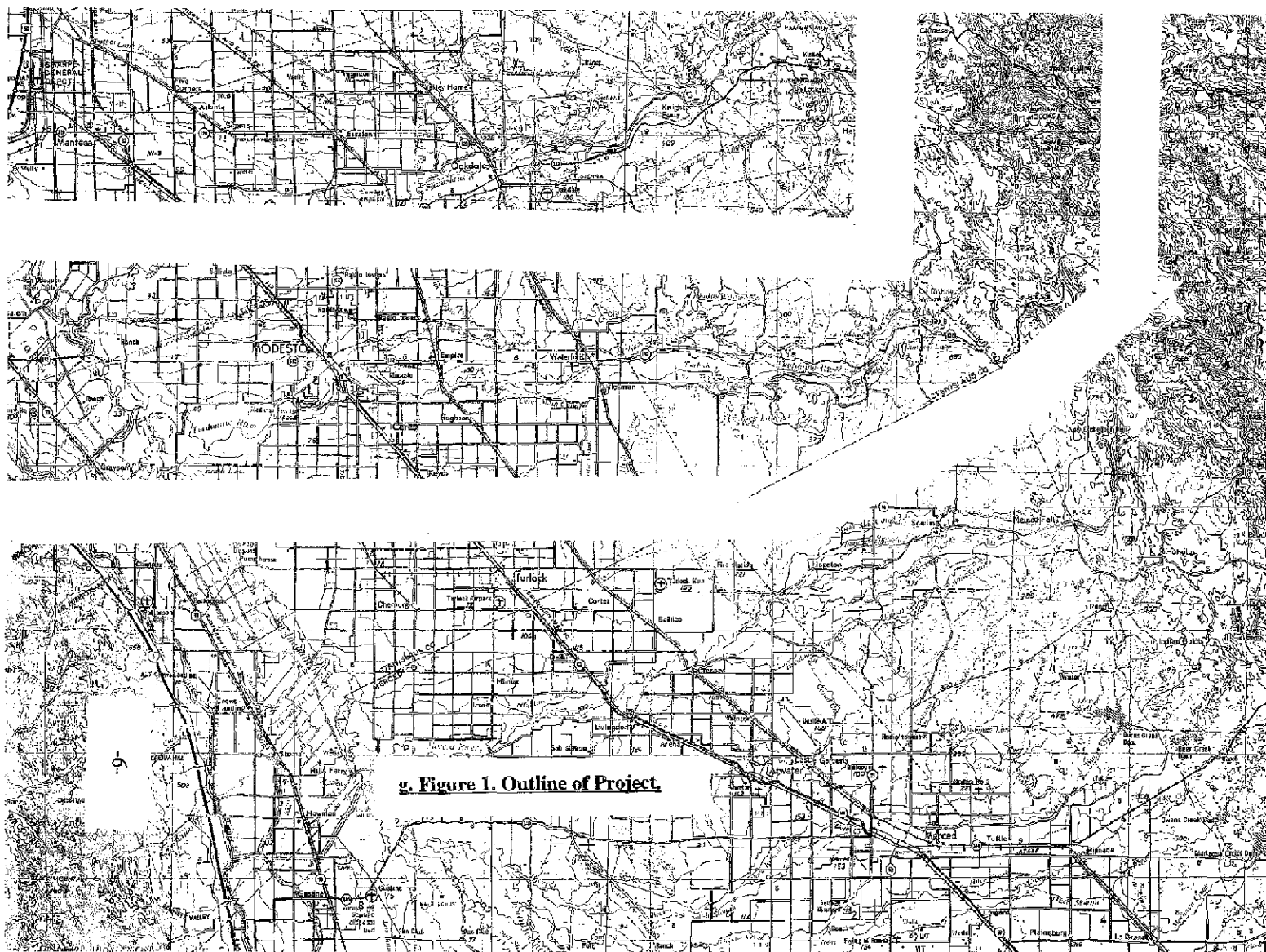
**e. Table 1. Project Schedule.**

TASK	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	1999	1999										
2	1999	1999	1999	2000	2000	2000						
3					2000	2000	2000	2000	2000	2000		
4					2000	2000	2000	2000	2000	2000	2000	2000
5	2000	2000	2000	2001	2001	2001	2001	2001	2001	2001		
6	2000	2000	2000	2001	2001	2001	2001	2001	2001	2001	2001	2001
7	ALL	ALL	ALL	ALL	ALL	ALL	ALL	ALL	ALL	ALL	ALL	ALL

**f. Location of the Project.** The Tuolumne River Sediment Management Plan covers the reach between New Don Pedro Reservoir and the junction with the San Joaquin River, and herein the reach between La Grange Dam and the junction with the San Joaquin River will be called the lower reach. This planning project along the Tuolumne River and New Don Pedro Reservoir, lies entirely within Tuolumne and Stanislaus Counties, California. It is shown in figure 1.

The Tuolumne River is a tributary of the San Joaquin River. The Tuolumne originates in the Sierra Nevada and flows in a general westerly direction until it joins the San Joaquin River in the Central Valley, approximately ten miles west of Modesto, California. Two large reservoirs on the main stem of the Tuolumne River, Hetch Hetchy and New Don Pedro, provide substantial regulation of the river's flow in the reach downstream from La Grange Dam. Water is diverted from the river at Hetch Hetchy Reservoir for municipal water supply and at La Grange Reservoir mainly for agricultural irrigation. Thus, the flow of water in the reach covered by the Tuolumne River Sediment Management Plan is controlled mainly by the reservoir operators and not by the Tuolumne watershed's natural hydrology.





## ECOLOGICAL/BIOLOGICAL BENEFITS

**a. Ecological/Biological Objectives.** The Strategic Goal for this sediment management plan is a subset of the second goal of the CALFED Bay-Delta Program (Ecosystem Restoration Plan, 1999 [ERP], Volume 1, page 1) as applied to the Tuolumne River: Rehabilitate the natural fluvial conditions (slowly aggrading, meandering, gravel bed; alluvial sediment and water flow) of the lower reach of the Tuolumne River to provide habitat for chinook salmon and steelhead trout and their food chain. The sediment management plan is needed because gold mining, gravel mining, dams and flow diversions have degraded the natural habitats of the chinook salmon and steelhead trout native to the river. Those fish are high priority, at-risk species (ERP, Volume I, page 177) and the restoration of their habitat is important for their recovery. The primary expected benefit, after the sediment management plan is implemented, is a substantial increase in the number of these native fish. The secondary expected benefit, after the sediment management plan is implemented, is a sediment transport process in or near dynamic equilibrium along the lower reach of the Tuolumne River, with "natural" gravel riverbeds near the upstream end of the reach and sand beds near the downstream end.

The applicable Strategic Objectives for this sediment management plan are subsets of the 1999 Strategic Objectives (ERP, Volume 1, pages 54, 72-73, 80, 89) as applied to the Tuolumne River: 1) Make sure that high flows occur frequently enough in the lower reach to maintain channel and flood plain geometry and river-bed-sediment grain-size distributions favorable to chinook salmon; 2) restore gravel supplies to the upstream end of the lower reach of the Tuolumne River, just downstream from the La Grange Reservoir and restore the natural sediment transport processes along the lower reach; 3) increase the extent of freely meandering reaches and other pre-1850 river channel forms; 4) re-establish frequent inundation of the flood plains of the lower reach by removing, breaching, or setting back levees and by providing releases from La Grange Dam capable of inundating the flood plains. The sediment management plan will guide the application of ongoing and possible additional projects to meet these Strategic Objectives, especially objective #2. The assumption that these habitat improvements will substantially increase the number of native fish spawning in the Tuolumne River will be evaluated by the monitoring tasks of this project.

**b. Linkages.** The sediment management plan will provide a long term overview of the effectiveness of four existing CALFED projects and may provide the motivation for additional projects. The plan will examine the need for additional projects, propose those needed, and will monitor the progress towards the development of a natural gravel-bed river of both the existing and new projects.

The sediment management plan is a direct response to the Course Sediment Supply Target, programmatic actions, stage 1 actions and rationale described on page 435 of ERP, Volume II. However, the sediment management plan for the lower reach must also address the river channel and flood plain geometry, the riverbed sediments and inflowing sediments (if any), and the river hydrology as one integrated fluvial transport system for both water and sediment.

The sediment management plan is linked to the Base Flow Target described on pages 431, 432, 434 of ERP, Volume II and the Flood Processes Target described on pages 437-438 of ERP, Volume II. The desire to provide a natural riverbed and sediment transport regime must consider and include the life-cycle flow-rate needs of chinook salmon, steelhead trout, and other biota. Both the river morphology and the local life forms evolved in the historical hydrologic environment of summer drought, winter storms and spring snowmelt runoff. The hydrology of the lower Tuolumne River is currently restricted to include the hydrology limits in the 1995 FERC Order for New Don Pedro Dam and may be affected by the recommendation that the U.S. Army Corps of Engineers conduct a study of the channel capacity in the lower reach of the Tuolumne River.

The sediment management plan is linked to the Stream Meander Targets described on pages 435, 436 of ERP, Volume II. The plan will include the planning of the ongoing and future projects for the restoration of a "natural," meandering, gravel bed river.

The sediment management plan is linked to the Natural Flood Plain and Flood Processes target described on pages 437, 438 of ERP, Volume II. The plan will include the planning of the ongoing and future projects for the restoration of the flood plains of a "natural," gravel bed river.

**c. System-Wide Ecosystem Benefits.** The movement towards restoration of the historical hydrology, sediment transport, and biota of the Tuolumne River will move the downstream San Joaquin River and the Delta closer to its historical, natural state. The mining of the gravel deposited in New Don Pedro Reservoir will extend the useful life of the corresponding reservoir storage capacity.

**d. Compatibility with Non-Ecosystem Objectives.** The sediment management plan may provide levee system integrity and flood control benefits along the lower reach of the Tuolumne River, but may also impact flood control operations. The sediment management plan may prevent the degradation of the river channel and the undermining of bridge foundations. The sediment management plan may have impacts on water supply deliveries from the Tuolumne River.

## **TECHNICAL FEASIBILITY AND TIMING**

The Tuolumne River Sediment Management Plan is proposed in response to a "focused action" for habitat restoration on the Tuolumne River in the February 1999 proposal solicitation package, page 21: "develop a sediment management plan for the Tuolumne River that includes evaluating coarse and fine sediment transport and the need to augment gravel supplies, and is consistent with efforts to restore the Tuolumne River corridor." No alternative projects were considered or evaluated.

The Tuolumne River Sediment Management Plan does not include any tasks that are known to require environmental compliance documents, permits or agreements and there are no other constraints that would impact the schedule of the project. There are no outstanding implementation issues that would impede the development of this sediment management plan.

## MONITORING AND DATA COLLECTION METHODOLOGY

**a. Biological/Ecological Objectives.** The primary expected benefit, after the sediment management plan is implemented, is a substantial increase in the number of the native, at-risk fish (chinook salmon and steelhead trout). The habitat restoration of the many projects included in the sediment management plan is expected to increase spawning, decrease mortality caused by poor food supply and predation, and facilitate travel both upstream and downstream along the lower reach of the Tuolumne River. The secondary expected benefit, after the sediment management plan is implemented, is a sediment transport process in or near dynamic equilibrium along the lower reach of the Tuolumne River, with "natural" gravel riverbeds near the upstream end of the reach and sand beds near the downstream end. The second phase of this project includes monitoring components for the sediment transport parameters and the fish populations for the various implemented projects. The sediment management plan will include monitoring components for the sediment transport parameters and the fish populations for the future, to-be-implemented projects proposed in the first phase of this project.

**b. Monitoring Parameters and Data Collection Approach.** A fish counting station will be established at the East Modesto Road Bridge to identify and count the migrating at-risk fish in the lower reach. Standard U.S. Geological Survey bed load traps and suspended sediment traps will be used at six bridges, together with the flow rate measurements of the U.S. Geological Survey at two gauging stations ( Tuolumne River below La Grange Dam and Tuolumne River at Modesto) to measure the sediment transport rates, define sediment rating curves, and infer the sediment erosion/deposition rates along the lower reach of the Tuolumne River. Experimental bed load traps may also be used. Cross sections will be measured, and their riverbed sediments will be sampled to define the changes in channel and flood plain geometry and the spatial distribution of sediment that occur as future fluvial dynamic processes operate on the lower reach of the river.

**c. Data Evaluation Approach.** The year-to-year history of the fish count will be used to evaluate the success of the overall restoration efforts. Evaluation will be done by comparison of the fish count with that of the older, larger river and with the count of the present-day river; Evaluation will also be done by comparison of the fish count with the counts of nearby undisturbed streams of the same size and fluvial morphology.

The sediment transport data will be used to calculate the annual mass balance of each grain size collected in the sediment samples. The mass balances will show how near the sediment transport is to dynamic equilibrium on a year-by-year and long term basis. The data will be compared with the sediment transport computer model results to determine the level of accuracy of the model predictions of the mass balance. The cross section data also will be compared on a year-by-year and long term basis to demonstrate dynamic equilibrium. The data will be compared with the sediment transport computer model results to determine the level of accuracy of the model predictions of the changes in the geometry and sediment distributions.

**d. Table 2. Monitoring and Data Collection Information**

Hypothesis to be Evaluated	Monitoring Parameters and Data Collection Approach	Data Evaluation Approach	Comments Data Priority
Increase in fish population	Fish count	Year-to-year count comparisons	Long term priority = 1
Dynamic sediment transport equilibrium	Sediment transport rate measurements	Mass balance	Short term priority = 1
Riverbed geometric and sediment distribution dynamic equilibrium	Cross section surveys and sediment distribution sampling	Year-to-year flow area and sediment size comparisons	Short and long term priority = 2

## LOCAL INVOLVEMENT

**a. County Notification.** The Stanislaus and Tuolumne County Boards of Supervisors and Planning Departments have been notified in writing of the potential submission of this proposal.

**b. Other Local Groups.** The Turlock Irrigation District and the Tuolumne River technical working group have been notified in writing of the potential submission of this proposal. The TID already has significant CALFED funding for restoration work on the Tuolumne River and is proposing to continue working on the river. The California Department of Fish and Game has two smaller projects to improve the habitat near the Basso Bridge, one of 16 bridges crossing the Tuolumne River in the lower reach. Cooperation with the TID and the other members of the Tuolumne River technical working group will begin if and when this proposal is funded. This cooperation will be the principal mechanism of interaction with the other entities working on restoration of the Tuolumne River.

**c. Local Owners.** No local owners are known to be aware of the potential submission of this proposal.

**d. Public Outreach Plan.** If this proposal is funded, all water users, gravel pit operators, bridge and levee owners, and government agencies that can be identified as affected by the sediment management plan will be sent a copy of the final project-defining document. The Tuolumne River technical working group will be the platform for informing the public of the progress of the development of the sediment management plan and for obtaining public input relative to that plan.

**e. Permission for Access.** There is no anticipated need for written permission for property use or access.

**f. Third Party Impacts.** The gravel pit operators and the water supply agencies and irrigation districts may have third party impacts of the projects proposed in the sediment management plan, but no impacts are anticipated during the development of that sediment plan.

## COST

**a. Table 3. Total Budget by Tasks.**

Task <sup>1</sup>	Direct Labor Hours	Direct Salary and Benefits <sup>2</sup>	Service Contracts	Material and Acquisition Costs	Miscellaneous and other Direct Costs	Overhead and Indirect Costs	Total Budget <sup>3</sup>
Task 1	80	\$3,032.00		\$30,000.00	\$8,000.00	\$2,968.00	\$44,000.00
Task 2	560	\$21,224.00			\$2,000.00	\$20,776.00	\$44,000.00
Task 3	560	\$21,224.00			\$2,000.00	\$20,776.00	\$44,000.00
Task 4	560	\$21,224.00			\$2,000.00	\$20,776.00	\$44,000.00
Task 5	560	\$21,224.00			\$8,000.00	\$20,776.00	\$50,000.00
Task 6	560	\$21,224.00			\$2,000.00	\$20,776.00	\$44,000.00
Task 7	120	\$4,548.00				\$4,452.00	\$9,000.00

**b. Table 4. Quarterly Budgets**

Task <sup>1</sup>	Quarterly Budget Oct-Dec 1999	Quarterly Budget Jan-Mar 2000	Quarterly Budget Apr-June 2000	Quarterly Budget July-Sept 2000	Total Budget <sup>3</sup> FY 2000
Task 1	\$44,000.00				\$44,000.00
Task 2	\$22,000.00	\$22,000.00			\$44,000.00
Task 3		\$11,000.00	\$22,000.00	\$11,000.00	\$44,000.00
Task 4		\$11,000.00	\$22,000.00	\$11,000.00	\$44,000.00
Task 5					
Task 6					
Task 7	\$1,125.00	\$1,125.00	\$1,125.00	\$1,125.00	\$4,500.00
Total	\$67,125.00	\$45,125.00	\$45,125.00	\$23,125.00	\$180,500.00

Notes: 1) The task numbers refer to the tasks identified in the section of this proposal titled, "Project Description, c. Project Tasks."

2) Budget is based on FY 1999 direct labor costs. The expected inflation correction was 4% per annum and that was included in the direct labor hours.

3) Costs per task are based on estimates. The funding must permit transfers between tasks and between budget quarters.



Task <sup>1</sup>	Quarterly Budget Oct-Dec 2000	Quarterly Budget Jan-Mar 2001	Quarterly Budget Apr-June 2001	Quarterly Budget July-Sept 2001	Total Budget <sup>3</sup> FY 2001
Task 1					
Task 2					
Task 3					
Task 4					
Task 5	\$20,000.00	\$10,000.00	\$10,000.00	\$10,000.00	\$50,000.00
Task 6	\$11,000.00	\$11,000.00	\$11,000.00	\$11,000.00	\$44,000.00
Task 7	\$1,125.00	\$1,125.00	\$1,125.00	\$1,125.00	\$4,500.00
Total	\$32,125.00	\$22,125.00	\$22,125.00	\$22,125.00	\$98,500.00

Notes: 1) The task numbers refer to the tasks identified in the section of this proposal titled, "Project Description, c. Project Tasks."

2) Budget is based on FY 1999 direct labor costs. The expected inflation correction was 4% per annum and that was included in the direct labor hours.

3) Costs per task are based on estimates. The funding must permit transfers between tasks and between budget quarters.

**c. Management Costs by Management Task.** The preparation of quarterly and annual financial reports ( 4 hours per quarter) and the management and supervision of workers (12 hours per quarter) are the two subtasks within the project management task.

**d. Explanation of How Overhead and Indirect Costs Are Calculated.** Direct salary and benefits (DS&B) are charged as an average over all the staff who work directly on projects at the Technical Service Center. Overhead and indirect costs include indirect labor and benefits (48 % of DS&B), rent and utilities (32% of DS&B), and equipment and supplies (18% of DS&B).

**e. Schedule of the Payments for Tasks Accomplished.**

The U.S. Bureau of Reclamation Technical Service Center uses a daily management information system to track project cost reporting. Bills are sent to customers monthly, and therefore the project funds could be authorized quarterly in advance. The quarterly reports will identify the specific tasks completed during each quarter.

## **COST-SHARING**

There is no proposed cost sharing for the sediment management plan.

## APPLICANT QUALIFICATIONS

**a. Identity and Responsibilities of Workers.** Chih Ted Yang (Manager, Sedimentation and River Hydraulics Group) supervises and directs the Sedimentation and River Hydraulics Group of the Technical Service Center, U. S. Bureau of Reclamation. He will be the technical expert for this project.

Peter J. Murphy (Hydraulic Engineer, Sedimentation and River Hydraulics Group, Technical Services Center, Bureau of Reclamation) will be the team leader (manager) for this project. He will also be the principal engineer for the hydrology, hydraulic and sediment transport aspects of the project, as well as the operator and interpreter of the computer models and the author of the project reports. He will be assisted in data collection and data entry by other staff members of the Sedimentation and River Hydraulics Group.

**b. Workers Qualifications and Experience.** Chih Ted Yang received the Bachelor of Science degree in Civil Engineering from National Cheng Kung University in 1962. He earned the Master of Science and Doctor of Philosophy degrees from Colorado State University in 1965 and 1968 respectively. He is a Professional Engineer registered in Colorado.

Dr. Yang is the author of a recent text book, *Sediment Transport: Theory and Practice*, McGraw-Hill, 1996, the author of more than 100 publications on sedimentation and river hydraulics, and an advisor and expert consultant to U. S. government agencies, the United Nations, and foreign government agencies on water resources projects. He is one of the original authors of the GSTARS 2.0 sediment model.

Peter J. Murphy received the Bachelor of Science degree in Naval Architecture and Marine Engineering from Webb Institute in 1962. He received the Doctor of Philosophy degree in Fluid Mechanics from the Johns Hopkins University in 1968. He is a Professional Engineer (Civil) registered in the Commonwealth of Massachusetts.

Since February 1998, Dr. Murphy has worked as a hydraulic engineer in the Sedimentation and River Hydraulics Group at the Technical Service Center of the U.S. Bureau of Reclamation. He has done a variety of tasks, including hydraulic design of a rock drop structure and a bridge, testing and improving the GSTARS 2.0 sediment-transport computer model, dam-break inundation studies, and assisting with and reviewing stream-channel restoration projects.

From August 1992 to February 1998, Dr. Murphy worked as a hydrologist on the Bridge Scour Project in the Massachusetts office of the U.S. Geological Survey. He did flood frequency analysis for locations in the Commonwealth of Massachusetts and assessed the risk of bridge failure caused by the undermining of the foundations during flood flows and conditions of high scour of riverbed materials.

From 1984 to 1992, Dr. Murphy served as an engineering consultant providing a number of studies of public-drinking-water distribution systems to determine the parts of the systems affected by contaminated sources within those water systems. The results of two of those

studies, in Santa Clara County, California and in Woburn, Massachusetts, were used by public health officials as the dose parts of dose-response environmental-health research projects.

From 1968 to 1984, Dr. Murphy served on the faculty of the Civil Engineering Departments of three Universities: La Universidad del Valle in Cali, Colombia; Cornell University in Ithaca, New York; the University of Massachusetts in Amherst, Massachusetts. He taught courses in the area of hydraulic engineering, supervised graduate students, and did research in the area of sediment transport.

The staff of the Sedimentation and River Hydraulics Group are engineering professionals specializing in applying the tools needed for solving reservoir and river sedimentation problems: hydrographic surveys of reservoirs and rivers, sediment sampling and analysis, fluvial geomorphology, steady and unsteady computer analysis of river hydraulics, and computer analysis of sediment transport. The experience of the Group includes sediment management and river restoration studies on the Rio Grande in New Mexico and the Elwha River in Washington.

c. Conflicts of Interest. There are no potential conflicts of interest.

Agreement No. \_\_\_\_\_

Exhibit \_\_\_\_\_

**ADDITIONAL STANDARD CLAUSES**

**Recycled Materials.** Contractor hereby certifies under penalty of perjury that 0 (enter value or "0" here) percent of the materials, goods and supplies offered or products used in the performance of this Agreement meets or exceeds the minimum percentage of recycled material as defined in Sections 12161 and 12200 of the Public Contract Code.

**Severability.** If any provision of this Agreement is held invalid or unenforceable by any court of final jurisdiction, it is the intent of the parties that all other provisions of this Agreement be construed to remain fully valid, enforceable, and binding on the parties.

**Governing Law.** This Agreement is governed by and shall be interpreted in accordance with the laws of the State of California.

**Y2K Language.** The Contractor warrants and represents that the goods or services sold, leased, or licensed to the State of California, its agencies, or its political subdivisions, pursuant to this Agreement are "Year 2000 compliant." For purposes of this Agreement a good or service is Year 2000 compliant if it will continue to fully function before, at, and after the Year 2000 without interruption and, if applicable, with full ability to accurately and unambiguously process, display, compare, calculate, manipulate, and otherwise utilize date information. This warranty and representation supersedes all warranty disclaimers and limitations and all limitations on liability provided by or through the Contractor.

**Child Support Compliance Act.** For any Agreement in excess of \$100,000, the Contractor acknowledges in accordance therewith, that:

1. The Contractor recognizes the importance of child and family support obligations and shall fully comply with all applicable state and federal laws relating to child and family support enforcement, including, but not limited to, disclosure of information and compliance with earnings assignment orders, as provided in Chapter 8 (commencing with Section 5200) of Part 5 of Division 9 of the Family Code; and
2. The Contractor, to the best of its knowledge, is fully complying with the earnings assignment orders of all employees and is providing the names of all new employees to the New Hire Registry maintained by the California Employment Development Department.

**STANDARD CLAUSES -  
CONTRACTS WITH THE UNITED STATES**

**Workers' Compensation Clause.** Contractor affirms that it is aware of the provisions of Section 3700 of the California Labor Code which require every employer to be insured against liability for workers' compensation or to undertake self-insurance in accordance with the provisions of that Code, and Contractor affirms that it will comply with such provisions before commencing the performance of the work under this contract. This provision shall apply to the extent provided by federal laws, rules and regulations.

**Claims Dispute Clause.** Any claim that Contractor may have regarding the performance of this agreement including, but not limited to, claims for additional compensation or extension of time, shall be submitted to the Director, Department of Water Resources, within thirty days of its accrual. State and Contractor shall then attempt to negotiate a resolution of such claim and process an amendment to this agreement to implement the terms of any such resolution. However, Contractor does not waive any rights or duties it may have as may be provided by federal laws, rules and regulations.

**Nondiscrimination Clause.** During the performance of this contract, the recipient, contractor and its subcontractors shall not deny the contract's benefits to any person on the basis of religion, color, ethnic group identification, sex, age, physical or mental disability, nor shall they discriminate unlawfully against any employee or applicant for employment because of race, religion, color, national origin, ancestry, physical handicap, mental disability, medical condition, marital status, age (over 40), or sex. Contractor shall insure that the evaluation and treatment of employees and applicants for employment are free of such discrimination. Contractor shall comply with the provisions of the Fair Employment and Housing Act (Government Code Section 12900 et seq.), the regulations promulgated thereunder (California Administrative Code, Title 2, Sections 7285.0 et seq.), the provisions of Article 9.5, Chapter 1, Part 1, Division 3, Title 2 of the Government Code (Government Code Sections 11135 - 11139.5), and the regulations or standards adopted by the awarding State agency to implement such article. Contractor or recipient shall permit access by representatives of the Department of Fair Employment and Housing and the awarding State agency upon reasonable notice at any time during the normal business hours, but in no case less than 24 hours' notice, to such of its books, records, accounts, other sources of information and its facilities as said Department or Agency shall require to ascertain compliance with this clause. Recipient, Contractor and its subcontractors shall give written notice of their obligations under this clause to labor organizations with which they have a collective bargaining or other agreement. The Contractor shall include the nondiscrimination and compliance provisions of this clause in all subcontracts to perform work under the contract.

**Availability of Funds.** Work to be performed under this contract is subject to availability of funds through the State's normal budget process.

**Audit Clause.** For contracts in excess of \$10,000, unless otherwise provided by federal laws, rules or regulations, the contracting parties shall be subject to the examination and audit of the State Auditor for a period of three years after final payment under the contract. (Government Code Section 8546.7).

**Payment Retention Clause.** Ten percent of any progress payments that may be provided for under this contract shall be withheld per Public Contract Code Sections 10346 and 10379 pending satisfactory completion of all services under the contract.

**Reimbursement Clause.** If applicable, travel and per diem expenses to be reimbursed under this contract shall be at the same rates the State provides for unrepresented employees in accordance with the provisions of Title 2, Chapter 3, of the California Code of Regulations. Contractor's designated headquarters for the purpose of computing such expenses shall be: Denver, CO

**Americans With Disabilities Act.** By signing this contract, Contractor assures the State that it complies with the Americans With Disabilities Act (ADA) of 1990, (42 U.S.C. 12101 et seq.), which prohibits discrimination on the basis of disability, as well as all applicable regulations and guidelines issued pursuant to the ADA.

**Conflict of Interest.** Current State Employees: a) No State officer or employee shall engage in any employment, activity or enterprise from which the officer or employee receives compensation or has a financial interest and which is sponsored or funded by any State agency, unless the employment, activity or enterprise is required as a condition of regular State employment. b) No State officer or employee shall contract on his or her own behalf as an independent contractor with any State agency to provide goods or services.

**Former State Employees:** a) For the two-year period from the date he or she left State employment, no former State officer or employee may enter into a contract in which he or she engaged in any of the negotiations, transactions, planning, arrangements or any part of the decision-making process relevant to the contract while employed in any capacity by any State agency. b) For the twelve-month period from the date he or she left State employment, no former State officer or employee may enter into a contract with any State agency if he or she was employed by that State agency in a policy-making position in the same general subject area as the proposed contract within the twelve-month period prior to his or her leaving State service.



IN REPLY REFER TO:

## United States Department of the Interior

BUREAU OF RECLAMATION  
RECLAMATION SERVICE CENTER

PO Box 25007  
Building 67, Denver Federal Center  
Denver, Colorado 80225-0007

Sedimentation and River Hydraulics Group: D-8540

April 1, 1999

Wilton Fryer  
Turlock Irrigation District  
P.O. Box 949  
Turlock, CA 95381-0949

Dear Mr. Fryer:

This purpose of this letter is to notify you, in your dual roles as an official with the Turlock Irrigation District and as the head of the technical working group concerned with the Tuolumne River below the New Don Pedro Dam, that the Sedimentation and River Hydraulics Group will submit a proposal to CALFED in response to the "Focused Action" for the Tuolumne River in the February 1999 CALFED Proposal Solicitation Package. That proposal will address the need for a *"sediment management plan for the Tuolumne River that includes evaluating course and fine sediment transport and the need to augment gravel supplies, and is consistent with efforts to restore the Tuolumne River corridor."*

Thank you for informing me, in our telephone conversation of March 30, that you anticipate that you and/or your consultants will submit a competing proposal. Your brief description of the history of the technical working group was also helpful. If the proposal of the Sedimentation and River Hydraulics Group is funded, I will look forward to joining the technical working group and supporting the overall restoration effort for the Tuolumne River.

Sincerely,

*Peter J. Murphy*

Peter J. Murphy



IN REPLY REFER TO:

## United States Department of the Interior

BUREAU OF RECLAMATION  
RECLAMATION SERVICE CENTER

PO Box 25007

Building 67, Denver Federal Center  
Denver, Colorado 80225-0007

Sedimentation and River Hydraulics Group: D-8540

April 1, 1999

Tuolumne County Board of Supervisors  
2 South Green Street  
Sonora, CA 95370

Dear Board of Supervisors :

This purpose of this letter is to notify you, in your role as officials of Tuolumne County, that the Sedimentation and River Hydraulics Group of the U. S. Bureau of Reclamation will submit a proposal to CALFED in response to the "Focused Action" for the Tuolumne River in the February 1999 CALFED Proposal Solicitation Package. That proposal will address the need for a *"sediment management plan for the Tuolumne River that includes evaluating course and fine sediment transport and the need to augment gravel supplies, and is consistent with efforts to restore the Tuolumne River corridor."* If the proposal of the Sedimentation and River Hydraulics Group is funded, we will look forward to supporting the overall restoration effort for the Tuolumne River.

Sincerely,

Peter J. Murphy, Hydraulic Engineer  
Sedimentation and River Hydraulics Group





IN REPLY REFER TO:

## United States Department of the Interior

BUREAU OF RECLAMATION  
RECLAMATION SERVICE CENTER

PO Box 25007

Building 67, Denver Federal Center  
Denver, Colorado 80225-0007

Sedimentation and River Hydraulics Group: D-8540

April 1, 1999

Tuolumne County Planning Department  
2 South Green Street  
Sonora, CA 95370

Dear Planning Department :

This purpose of this letter is to notify you, in your role as officials of Tuolumne County, that the Sedimentation and River Hydraulics Group of the U. S. Bureau of Reclamation will submit a proposal to CALFED in response to the "Focused Action" for the Tuolumne River in the February 1999 CALFED Proposal Solicitation Package. That proposal will address the need for a *"sediment management plan for the Tuolumne River that includes evaluating coarse and fine sediment transport and the need to augment gravel supplies, and is consistent with efforts to restore the Tuolumne River corridor."* If the proposal of the Sedimentation and River Hydraulics Group is funded, we will look forward to supporting the overall restoration effort for the Tuolumne River.

Sincerely,

Peter J. Murphy, Hydraulic Engineer  
Sedimentation and River Hydraulics Group



IN REPLY REFER TO:

## United States Department of the Interior

BUREAU OF RECLAMATION  
RECLAMATION SERVICE CENTER

PO Box 25007

Building 67, Denver Federal Center  
Denver, Colorado 80225-0007

Sedimentation and River Hydraulics Group: D-8540

April 1, 1999

Stanislaus County Board of Supervisors  
1100 H Street  
Modesto, CA 95354

Dear Board of Supervisors :

This purpose of this letter is to notify you, in your role as officials of Stanislaus County, that the Sedimentation and River Hydraulics Group of the U. S. Bureau of Reclamation will submit a proposal to CALFED in response to the "Focused Action" for the Tuolumne River in the February 1999 CALFED Proposal Solicitation Package. That proposal will address the need for a *"sediment management plan for the Tuolumne River that includes evaluating course and fine sediment transport and the need to augment gravel supplies, and is consistent with efforts to restore the Tuolumne River corridor."* If the proposal of the Sedimentation and River Hydraulics Group is funded, we will look forward to supporting the overall restoration effort for the Tuolumne River.

Sincerely,

Peter J. Murphy, Hydraulic Engineer  
Sedimentation and River Hydraulics Group



IN REPLY REFER TO:

## United States Department of the Interior

BUREAU OF RECLAMATION  
RECLAMATION SERVICE CENTER

PO Box 25007

Building 67, Denver Federal Center  
Denver, Colorado 80225-0007

Sedimentation and River Hydraulics Group: D-8540

April 2, 1999

Stanislaus County Planning Department  
1100 H Street  
Modesto, CA 95354

Dear Planning Department :

This purpose of this letter is to notify you, in your role as officials of Stanislaus County, that the Sedimentation and River Hydraulics Group of the U. S. Bureau of Reclamation will submit a proposal to CALFED in response to the "Focused Action" for the Tuolumne River in the February 1999 CALFED Proposal Solicitation Package. That proposal will address the need for a *"sediment management plan for the Tuolumne River that includes evaluating course and fine sediment transport and the need to augment gravel supplies, and is consistent with efforts to restore the Tuolumne River corridor."* If the proposal of the Sedimentation and River Hydraulics Group is funded, we will look forward to supporting the overall restoration effort for the Tuolumne River.

Sincerely,

Peter J. Murphy, Hydraulic Engineer  
Sedimentation and River Hydraulics Group